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10/707,656	12/30/2003	James Kenneth Aragones	RD28217-4	1655

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EXAMINER
THANGAVELU, KANDASAMY

ART UNIT	PAPER NUMBER
2123	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/707,656	ARAGONES, JAMES KENNETH	
	Examiner	Art Unit	
	Kandasamy Thangavelu	2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 July 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-35* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-35* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *30 december 2003* is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This communication is in response to the Applicant's Response mailed on July 19, 2007. Claims 1-4, 6, 8, 12-15, 17 and 23-33 were amended. Claims 34 and 35 were added. Claims 1-35 of the application are pending. This office action is made non-final.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-6, 8-17, 19-28 and 30-35 are rejected under 35 U.S.C. § 102(b) as being anticipated by **Bernier et al.** (U.S. Patent 4,215,412).

3.1 **Bernier et al.** teaches Real time performance monitoring of gas turbine engines. Specifically, as per claim 1, **Bernier et al.** teaches a system for building an engine baseline model for fuel-powered engines (Abstract, L1-5; Fig. 1, Items 54 and 64; CL1, L49-55; CL1, L68 to CL2, L4; CL5, L41-49; CL5, L61 to CL6, L3; CL12, L47-55), comprising:

a computer comprising one or more processors and a memory configured to store a program of instructions (Abstract, L1-2; Fig. 6);

an engine service database containing engine data for fuel-powered engines (CL1, L56-60; CL1, L65-67; CL5, L5-10);

a preprocessor for processing the engine data into a predetermined format (Abstract, L18-24; CL1, L60-65), wherein the preprocessor includes a data segmenting component that segments the engine data into a plurality of groups based upon specific types of engines (Abstract, L18-24; CL6, L17-23; CL35, L47-54) and further based upon specific time periods during which each data element was measured (Abstract, L12-16 and L24-29; CL1, L49-55; CL1, L67 to CL2, L4; CL15, L27-46);

an engine baseline modeling component that builds an engine baseline model for each of the plurality of groups using regression analysis (CL6, L17-25; CL12, L19-32; C12, L47-55), wherein the regression analysis relates engine performance variables as functions of engine operating parameters (Abstract, L1-5; CL2, L46-53; CL5, L19-28; CL5, L61 to CL6, L3; CL12, L19-32);

a display configured to display at least one aspect of engine baseline model (Fig. 6; Fig. 1, Item 68; CL14, L4-11: the display can be used for the display of models both during real time control and during off-line modeling and analysis).

Per claim 2: **Bernier et al.** teaches that the data segmenting component segments the engine data into the plurality of groups throughout a pre-selected moving time window (CL15, L59 to CL16, L24; CL16, L6-19).

Per claim 3: **Bernier et al.** teaches that the data segmenting component segments the engine data into the plurality of groups throughout discrete time ranges (Abstract, L5-18; Abstract, L24-29; CL1, L67 to CL2, L4).

Per claim 4: **Bernier et al.** teaches that the engine baseline modeling component generates a set of estimated regression parameters for each of the plurality of groups based upon the regression analysis, wherein each set of estimated regression parameters are representative of a baseline model for that group (CL5, L41-49; CL5, L61 to CL6, L3; CL12, L47-55; CL15, L59 to CL16, L24).

Per claim 5: **Bernier et al.** teaches that the engine baseline modeling component calculates a time series for each estimated regression parameter, and wherein the engine baseline modeling component further calculates a trend for each estimated regression parameter over time (Abstract, L5-18; Abstract, L24-29; CL1, L67 to CL2, L4; CL15, L59 to CL16, L24).

Per claim 6: **Bernier et al.** teaches means for identifying fluctuations in trends for each estimated regression parameter representative of engine; means for evaluating trends having identified fluctuations; and means for identifying parameter estimating trends relating to baseline trend shifts (CL15, L59 to CL16, L24).

Per claim 8: **Bernier et al.** teaches that the preprocessor comprises a data acquisition component that extracts engine data from the engine services database (CL1, L49-67; CL5, L19-28).

Per claim 9: **Bernier et al.** teaches that that the engine baseline modeling component comprises a metric component that validates the engine baseline model (Abstract, L5-12; CL15, L59 to CL16, L24).

Per claim 10: **Bernier et al.** teaches that the engine baseline modeling component comprises a heuristics component that generates rules for cleaning the preprocessed data (Abstract, L18-24; CL1, L60-65).

Per claim 11: **Bernier et al.** teaches a model diagnostics component that evaluates performance of the engine baseline model (Abstract, L5-12).

3.2 As per claim 12, **Bernier et al.** teaches a computer implemented method for building an engine baseline model for fuel-powered engines (Abstract, L1-5; Fig. 1, Items 54 and 64; CL1, L49-55; CL1, L68 to CL2, L4; CL5, L41-49; CL5, L61 to CL6, L3; CL12, L47-55), comprising:

storing engine data in an engine service database for fuel-powered engines (CL1, L56-60; CL1, L65-67; CL5, L5-10);

processing the engine data into a predetermined format in a preprocessor (Abstract, L18-24; CL1, L60-65), wherein the preprocessor includes a data segmenting component that segments

the engine data into a plurality of groups based upon specific types of engines (Abstract, L18-24; CL6, L17-23; CL35, L47-54) and further based upon specific time periods during which each data element was measured (Abstract, L12-16 and L24-29; CL1, L49-55; CL1, L67 to CL2, L4; CL15, L27-46);

building an engine baseline model for each of the plurality of groups using regression analysis (CL6, L17-25; CL12, L19-32; C12, L47-55), wherein the regression analysis relates engine performance variables as functions of engine operating conditions (Abstract, L1-5; CL2, L46-53; CL5, L19-28; CL5, L61 to CL6, L3; CL12, L19-32);

using the engine baseline model to monitor engine status, predict future engine behavior, diagnose engine faults, identify when engine performance is out of specification, identify engine quality, or design a new engine system, or a combination thereof (Abstract, L1-12 and L16-18; Fig. 1, Item 62).

3.3 As per Claim 23, it is rejected based on the same reasoning as Claim 12, supra. Claim 23 is a computer readable medium claim reciting the same limitations as Claim 12, as taught throughout by **Bernier et al.**

3.4 As per Claims 12-17, 19-22, 23-28 and 30-33, these are rejected based on the same reasoning as Claims 2-6 and 8-11, supra. Claims 12-17, 19-22, 23-28 and 30-33 are computer implemented method and computer readable storage medium claims reciting the same limitations as Claims 2-6 and 8-11, as taught throughout by **Bernier et al.**

3.5 As per claim 34, **Bernier et al.** teaches a computer implemented method for building an engine baseline model for combustion-based engines (Abstract, L1-5; Fig. 1, Items 54 and 64; CL1, L49-55; CL1, L68 to CL2, L4; CL5, L41-49; CL5, L61 to CL6, L3; CL12, L47-55), comprising:

storing engine data in an engine service database for combustion-based engines (CL1, L56-60; CL1, L65-67; CL5, L5-10);

processing the engine data into a predetermined format in a preprocessor (Abstract, L18-24; CL1, L60-65), wherein the preprocessor includes a data segmenting component that segments the engine data into a plurality of groups based upon specific types of engines (Abstract, L18-24; CL6, L17-23; CL35, L47-54) and further based upon specific time periods during which each data element was measured (Abstract, L12-16 and L24-29; CL1, L49-55; CL1, L67 to CL2, L4; CL15, L27-46);

building an engine baseline model for each of the plurality of groups using regression analysis (CL6, L17-25; CL12, L19-32; C12, L47-55), wherein the regression analysis relates engine performance variables as functions of engine operating conditions (Abstract, L1-5; CL2, L46-53; CL5, L19-28; CL5, L61 to CL6, L3; CL12, L19-32);

outputting at least one aspect of the engine baseline model for display on a monitor (Fig. 6; Fig. 1, Item 68; CL14, L4-11: the display can be used for the display of models both during real time control and during off-line modeling and analysis).

3.6 As per Claim 35, it is rejected based on the same reasoning as Claim 34, supra. Claim 35 is a computer readable storage medium claim reciting the same limitations as Claim 34, as taught throughout by **Bernier et al.**

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

5. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. Claims 7, 18 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Bernier et al.** (U.S. Patent 4,215,412) in view of **Rizzoni** (U.S. Patent 5,687,082).

6.1 As per claim 7, **Bernier et al.** teaches the system of claim 6. **Bernier et al.** does not expressly teach that the preprocessor maps engine data to an uncorrelated data set using a principal

component analysis technique. **Rizzoni** teaches that the preprocessor maps engine data to an uncorrelated data set using a principal component analysis technique (CL1, L9-14; CL3, L32-34; CL5, L4-7; CL7, L5-24). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the system of **Bernier et al.** with the system of **Rizzoni** that included the preprocessor mapping engine data to an uncorrelated data set using a principal component analysis technique, because principal component analysis is a very effective and efficient method for drilling a few essential features from very large set of data (CL7, L5-8); the method uses a matrix operation to compute the eigenvalues and eigenvectors of the covariance matrix of a known data set; the M principal components of the data set are defined as the M eigenvectors corresponding to the largest M eigenvalues of the covariance matrix (CL7, L12-14 and L22-24).

6.2 As per Claims 18 and 29, these are rejected based on the same reasoning as Claim 7, supra. Claims 18 and 29 are computer implemented method and computer readable storage medium claims reciting the same limitations as Claim 7, as taught throughout by **Bernier et al.** and **Rizzoni.**

Response to Arguments

7. Applicant's arguments with respect to claim rejections under 35 USC 112 Second Paragraph, 35 USC 101, 35 USC 102 (b) and 35 USC 103 rejections have been considered.

Claim rejections under 35 USC 112 Second Paragraph and 35 USC 101 are withdrawn in response to the applicant's amendments to the claims. Claim rejections under 35 USC 102 (b) and 103 (a) are maintained.

7.1 As per the applicant's argument that "Bernier does not teach or suggest an engine service database containing engine data for fuel-powered engines; the Examiner apparently equates "recorded engine performance data" with engine service database; nowhere does Bernier disclose or teach any engine service database; in Bernier, "recorded engine performance data is either transmitted to the ground based monitoring station or, more typically, stored on magnetic tape or other media within the aircraft for delivery to the ground station at a later convenient time"; the Bernier reference is completely silent about any "service database"; there apparently is no engine service database and Bernier does not teach or suggest engine service database", the Examiner takes the position that the applicant's engine service database contains only engine performance information. Applicant's attention is directed to Para 0020, Lines 1-4 and Lines 9-11. Therefore, the Examiner used the teachings of Bernier which also has engine performance information stored in the computer.

7.2 As per the applicant's argument that "Bernier does not teach or suggest a preprocessor for processing the engine data into a predetermined format, wherein preprocessor includes a data segmenting component that segments the engine data into a plurality of groups based upon specific types of engines and further based upon specific time periods during which each data element was measured; the Examiner apparently equates "processing within the particular

computer" with a preprocessor for processing the engine data into a predetermined format; nowhere does Bernier disclose or teach any preprocessor for processing the engine data into a predetermined format; in Bernier, "once the engine data is received at the ground station, it is generally "conditioned" by filtering techniques to remove a substantial portion of the noise content and to normalize the data so that it is amenable to processing within the particular computer and analysis routine that is employed; after such conditioning and normalization, the data is stored within a data bank for later computer processing; this processing is performed on a periodic basis to determine the temporal or trend characteristics of the monitored engine parameters, which trend information is useful in supplementing periodical overhaul policies to prevent premature removal of an engine; additionally, when an engine fails in service, the previously recorded engine performance data can be processed within the computer to aid in determining the cause of engine failure and hence ensure that adequate overhaul procedures are followed before the engine is returned to service"; the Bernier reference is completely silent about any "preprocessor"; there apparently is no preprocessor for processing the engine data into a predetermined format", the Examiner respectfully disagrees. The Examiner takes the position that the data that is conditioned by Bernier involves preprocessing the engine data into a predetermined format. This preprocessing includes segmenting that segments the engine data into a plurality of groups based upon specific types of engines and further based upon specific time periods during which each data element was measured. The Bernier reference deals with data for different types of engines and different time periods for modeling the engine performance.

Bernier teaches a preprocessor for processing the engine data into a predetermined format (Abstract, L18-24; CL1, L60-65), wherein the preprocessor includes a data segmenting component that segments the engine data into a plurality of groups based upon specific types of engines (Abstract, L18-24; CL6, L17-23; CL35, L47-54) and further based upon specific time periods during which each data element was measured (Abstract, L12-16 and L24-29; CL1, L49-55; CL1, L67 to CL2, L4; CL15, L27-46).

7.3 As per the applicant's argument that "Bernier does not teach or suggest an engine baseline model for each of the plurality of groups using regression analysis; the apparently equates determination of a set of desired dependent engine parameters with an engine baseline model for each of the plurality of groups using regression analysis; nowhere does Bernier disclose or teach any engine baseline model for each of the plurality of groups using regression analysis; Bernier, merely "a set of independent engine parameters for estimating the values of a set of desired dependent engine parameters is determined from engine performance data of the particular type of engine to be monitored, by linear regression analysis of such engine performance data"; the Bernier reference is completely silent about any "baseline model"; there apparently is no engine baseline model for each of the plurality of groups using regression analysis", the Examiner takes the position that the applicant's baseline models deal with only regression models for engine performance prediction. Therefore, the Examiner maintains that Bernier's regression models are same as the baseline models of the applicant.

7.4 As per the applicant's argument that "Bernier fails to teach or suggest a data acquisition component that extracts engine data from the engine services database; Bernier only discloses that once the engine data is received at the ground station, it is generally "conditioned" by filtering techniques to remove a substantial portion of the noise content and to normalize the data so that it is amenable to processing within the particular computer and analysis routine that is employed; after such conditioning and normalization, the data is stored within a data bank for later computer processing; Bernier fail to disclose any data acquisition component or any extraction of engine data from the engine services database", the Examiner respectfully disagrees. The Examiner takes the position that Bernier teaches a data acquisition component that extracts engine data from the engine services database sine the engine service database in the applicant's invention is same as the engine performance data and Bernier teaches using the engine performance data for modeling.

7.5 As per the applicant's argument that "Gleeson reference fails to disclose mapping engine data to an uncorrelated data set using a principal component analysis technique; Gleeson specifically discloses that "the SIMCA method uses principal component analysis to construct a model for each class, i.e. pass/fail; factor analysis is used to calculate the significant chemical patterns for each class; the significant patterns are known as the principal components; the principal component analysis provides a convenient method for data compression; it also provides a rotation of the data to an orthonormal basis, removing any co-linearities in the data; the principal components form a new set of axes for the data"; the use of principal component analysis to construct a pass/ fail model for each class or to calculate the significant chemical

patterns for each class or for any other kind of data compression is completely different from mapping engine data to an uncorrelated data set; for at least this reason, the hypothetical combination of Bernier and Gleeson cannot support a prima facie case of obviousness of the present claims", the Examiner has used a new reference **Rizzoni**. **Rizzoni** teaches that the preprocessor maps engine data to an uncorrelated data set using a principal component analysis technique (CL1, L9-14; CL3, L32-34; CL5, L4-7; CL7, L5-24).

Conclusion

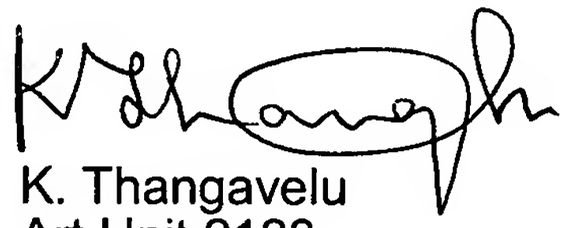
8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Kandasamy Thangavelu whose telephone number is 571-272-3717. The examiner can normally be reached on Monday through Friday from 8:00 AM to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Rodriguez, can be reached on 571-272-3753. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to TC 2100 Group receptionist: 571-272-2100.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR.

Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



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Art Unit 2123
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